NUMBER SIXTY-FOUR **'TRADER' SERVICE SHEETS**

MARCONIPHONE 224

A.C./D.C. SUPERHET

THE Marconi Model 224 is a 3-valve (plus rectifier) A.C./D.C. superhet with a form of reflex circuit. It is similar in most respects to the earlier Model 223. A console model (236) is also available.

CIRCUIT DESCRIPTION

Two alternative aerial connections (one, **A2,** via fixed series resistance **R1**) to image suppression condenser **C26** and coupling coil **L2.** **L1** and **C25** across aerial circuit form an acceptor trap designed to by-pass morse interference of similar wavelength to the intermediate frequency.

Single-tuned circuit **L3, L4, C27** precedes first valve, a heptode (**V1, Marconi metallised X30**) operating as frequency changer with electron coupling. Oscillator grid tuning coils **L5, L6** tuned by **C29**; anode reaction coils **L7, L8**; tracking by specially shaped condenser vanes and fixed condenser **C7** (L.W.).

Second valve (**V2, Marconi metallised WD30**) is a double diode H.F. pentode which operates as variable-mu intermediate frequency amplifier, second detector, automatic volume control valve, and L.F. amplifier. Coupling between **V1** and **V2** pentode section is by a tuned-primary tuned-secondary transformer **L9, L10,** and a similar transformer **L11, L12,** is used for coupling to one diode anode. Second diode is connected to earth and acts as a screen. Rectified output is developed across load resistance **R14,** and the D.C. component is fed back as G.B. to F.C. and I.F. valves, giving A.V.C. The audio-frequency component is also fed to control grid of **V2** pentode for L.F. amplification, and the resultant output is developed across anode load resistance **R13** which, with **C17** and manual volume control **R15,** forms coupling to output pentode (**V3, Marconi N30 Catkin**). Tone compensation by fixed condenser **C20.**

Sensitivity switch **S5** when closed converts **V2** into a grid leak detector and thus reduces its amplification.

When the receiver is used with A.C. mains, H.T. current is supplied by a rectifying valve (**V4, Marconi U30**), which is a full-wave type operating on half-wave system with its anodes and cathodes strapped. With D.C. supplies, this behaves as a low resistance. Smoothing by choke **L16** and electrolytic condensers **C15, C21.**

Speaker field winding **L15** is connected across main H.T. supply.

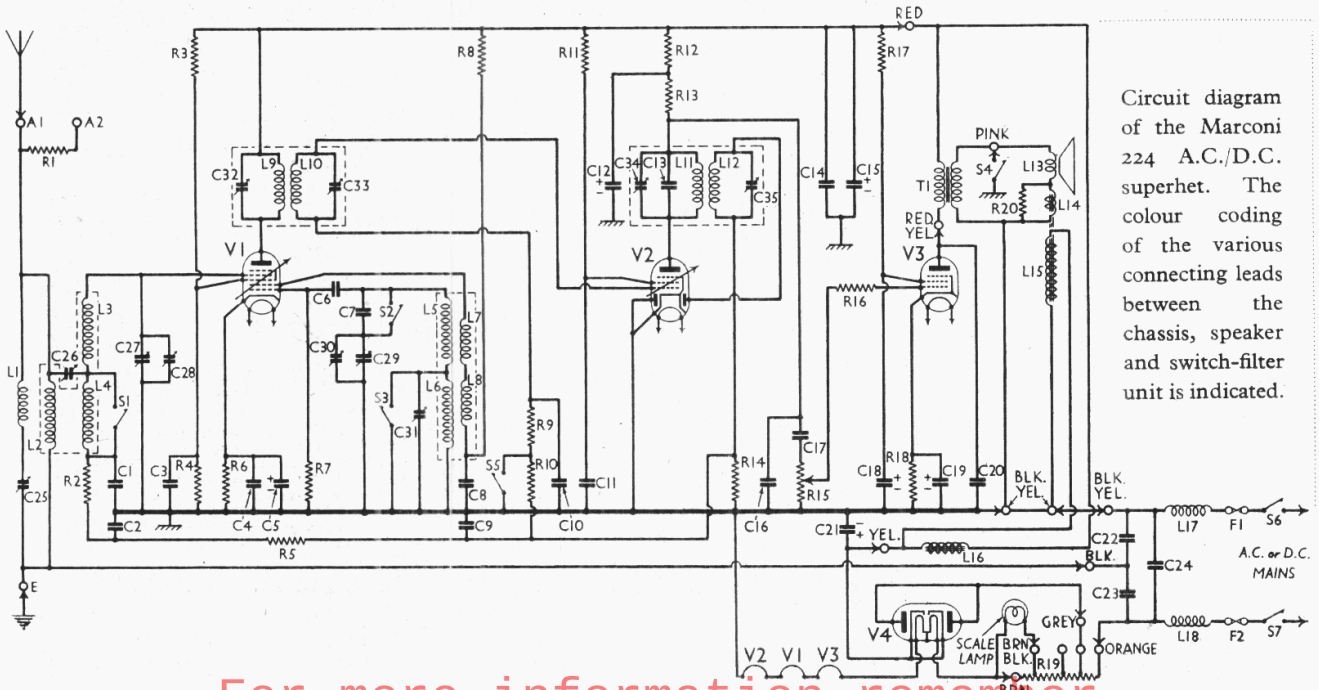
Heaters of all valves are connected in series together with tapped ballast resistor **R19** across mains supply. Scale lamp derives its current from one tapping, and other tappings provide adjustment for various mains voltages.

Special filter unit in mains circuit prevents interference caused by mains-borne disturbances. Unit comprises air-cored chokes **L17, L18** and condensers **C22, C23, C24,** and includes fuses **F1, F2** and switches **S6, S7.**

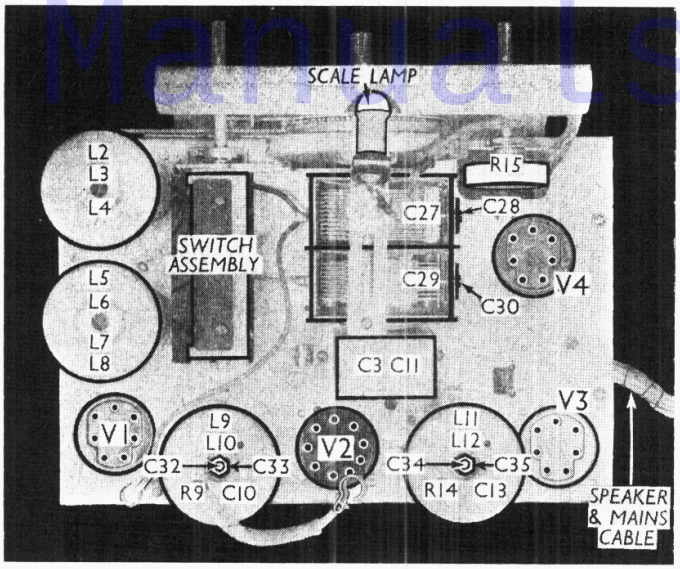
COMPONENTS AND VALUES

	Condensers	Values (μF)
C1	V1 tet. cont. grid decoupling	0·1
C2	V1 A.V.C. line decoupling	0·01
C3	V1 S.G.'s by-pass	0·5
C4	V1 cathode by-passes	0·1
C5*	V1 cathode by-passes	50·0
C6	V1 osc. grid condenser	0·0001
C7	Osc. L.W. tracker	0·0005
C8	V1 osc. anode decoupling	0·1
C9	I.F. by-passes	0·002
C10	I.F. by-passes	0·0005
C11	V2 S.G. by-pass	0·5
C12*	V2 anode decoupling	4·0
C13	2nd I.F. trans. pri. tuning	0·0001
C14	H.T. smoothing	0·1
C15*	H.T. smoothing	12·0
C16	V2 anode I.F. by-pass	0·0005
C17	L.F. coupling to V3	0·1
C18*	V3 aux.grid by-pass	1·0
C19*	V3 cathode by-pass	50·0
C20	Tone compensator	0·002
C21*	H.T. smoothing	12·0
C22	Parts of mains disturbance filter unit	0·005
C23		0·005
C24		0·01
C25‡	Aerial I.F. filter tuning	—
C26‡	Image suppressor	—
C27	Aerial circuit tuning	—
C28‡	Aerial circuit trimmer	—
C29	Oscillator tuning	—
C30‡	Oscillator main trimmer	—
C31‡	Oscillator L.W. trimmer	—
C32‡	1st I.F. trans. pri. tuning	—
C33‡	1st I.F. trans. sec. tuning	—
C34‡	2nd I.F. trans. pri. tuning	—
C35‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. ‡ Pre-set.



Circuit diagram of the Marconi 224 A.C./D.C. superhet. The colour coding of the various connecting leads between the chassis, speaker and switch-filter unit is indicated.



Plan view of the chassis. Note the dual I.F. trimmers at the centre of each I.F. transformer screen. R9, C10 and R14, C13 are included inside these screens. The connections of V2 are given overleaf.

	Resistances	Values (ohms)
R1	Aerial series resistance	10,000
R2	V1 tet. cont. grid decoupling	100,000
R3	V1 S.G.'s pot. divider	35,000
R4	V1 S.G.'s pot. divider	50,000
R5	V1 A.V.C. line decoupling	350,000
R6	V1 fixed G.B. resistance	230
R7	V1 osc. grid resistance	50,000
R8	V1 osc. anode decoupling	100,000
R9	I.F. stoppers	100,000
R10	I.F. stoppers	23,000
R11	V2 S.G. H.T. feed	75,000
R12	V2 anode decoupling	5,000
R13	V2 anode load	35,000
R14	V2 diode load	500,000
R15	Manual volume control	200,000
R16	V3 grid I.F. stopper	50,000
R17	V3 aux. grid H.T. feed	10,000
R18	V3 auto. G.B. resistance	230
R19	Heaters ballast, total	640
R20	Hum neutralising coil shunt	1·25

	Other Components	Values (ohms)
L1	Aerial I.F. filter coil	50·0
L2	Aerial coupling coil	15·0
L3	Aerial tuning coils	4·0
L4	Aerial tuning coils	26·0
L5	Oscillator tuning coils	1·5
L6	Oscillator tuning coils	5·0
L7	Oscillator anode coils, total	6·5
L8	Oscillator anode coils, total	
L9	1st I.F. trans. Pri.	5·0
L10	1st I.F. trans. Sec.	5·0
L11	2nd I.F. trans. Pri.	3·5
L12	2nd I.F. trans. Sec.	5·0
L13	Speaker speech coil	1·8
L14	Hum neutralising coils	0·3
L15	Speaker field winding	5,000·0
L16	H.T. smoothing choke	475·0
T1	Speaker input trans. Pri.	725·0
T1	Speaker input trans. Sec.	0·2
S1-S3	Waveband switches	—
S4	Speaker muting switch	—
S5	Sensitivity switch	—
S6, S7	Mains switches	—
F1, F2	Mains circuit fuses, 0·75A	—

DISMANTLING THE SET

Removing Chassis.—To remove chassis, remove mains plug, back and three control knobs (recessed screws). Take care not to lose screws and *when replacing* cover with wax or similar insulating material.

Remove the two wooden strips underneath cabinet (two wood screws each), thus exposing the four bolts holding chassis, each with a spring washer and a large metal washer. Remove these and also clip on right-hand side of cabinet, holding speaker and mains leads.

Chassis can now be withdrawn to extent of speaker leads, which is enough for normal purposes. Between chassis and cabinet bottom are four large washers which need not be removed as they are recessed into cabinet and will not easily fall out. If they should be removed, do not forget to replace them when inserting chassis.

If it is necessary to remove chassis entirely, free the two leads from mains switch terminals and brown, brown-black and grey leads on mains resistance. It is not necessary to remove orange lead. *When replacing*, brown lead should be connected to first terminal from left, brown-black to second terminal and grey to 216-235 V. tapping.

The six leads to speaker transformer should now be disconnected, and as tags are spade type, terminals need not be unscrewed entirely. Transformer is coded so that there will be no difficulty in replacing. Chassis can now be withdrawn.

Removing Speaker.—Before removing speaker, remove mains resistance unit. To do this, remove knurled escutcheon from mains switch on side of cabinet and four wood screws holding cowl to wooden fillets. Resistance unit can now be withdrawn. *When replacing*, note that the two screws on left are fitted with washers.

Speaker, input transformer and choke can now be removed as a unit by withdrawing the four bolts (each with a washer and lock washer) holding it to sub-baffle.

VALVE ANALYSIS

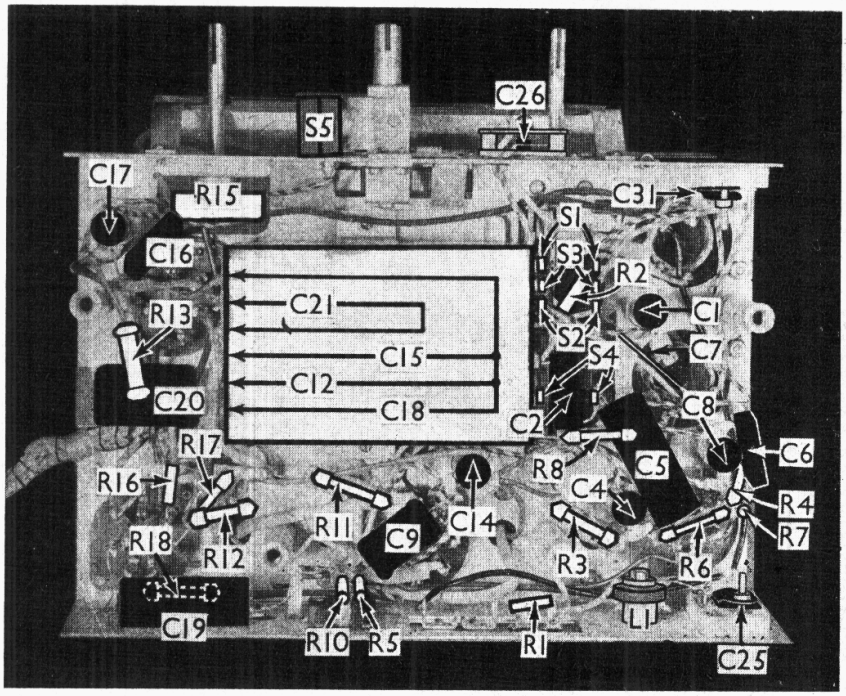
Below is a table of valve voltages and currents measured on our chassis when it was operating from 230 V A.C. mains. Measurements were made with no signal input and the volume and sensitivity controls in the "maximum" positions. Voltages were read on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 X30*	215	1·1	65	2·9
V2 WD30	75	3·2	60	2·0
V3 N30	200	22·0	155	6·1
V4 U30†	—	—	—	—

* Osc. anode (G2) 60V, 1·3 mA.

† 240 V, cathode to chassis.

(*Continued overleaf*)



Under-chassis view. The internal connections of the large condenser block are indicated, as are also the four switches in the wavechange switch assembly. S5 is operated by the push-pull action of the tuning control.

MARCONI 224 (contd.)

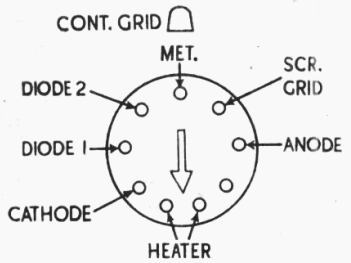
GENERAL NOTES

Switches.—**S1-S3** are the waveband switches, and **S4** the muting switch, all included in the main switch assembly, and indicated in our under-chassis view. The first three are all closed on the M.W. range, and open on the L.W. range. **S4** is open in both switch positions, but closes in between these positions.

S5 is the Q.M.B. sensitivity switch, operated by pulling or pushing the tuning control knob. The switch is closed in the least sensitive position.

S6 and **S7** are the Q.M.B. mains switches, ganged together and mounted on the filter and fuse unit.

Coils.—**L1** is unscreened, and is beneath the chassis. The remaining coils are in four screened units on the chassis deck, seen in our plan chassis view. Note that the first I.F. transformer unit contains, in addition to the coils and trimmers, the components **R9** and **C10,** while the second

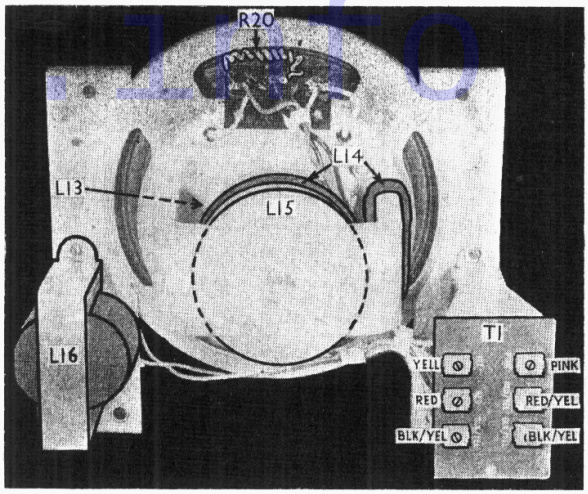


Connections of V2, a double diode H.F. pentode, looking at the underside of the base.

I.F. contains **R14** and **C13.** The trimmers are of the dual type, with a slotted screw operating the primary trimmer, and a hexagonal nut operating that of the secondary.

Scale Lamp.—This is of the Osram M.E.S. type, rated at 6.2 V 0.3 A.

Condenser Block.—This is a large unit, seen in the under-chassis view, containing four dry electrolytic condensers. The connections are indicated by arrows in our illustration. Note that **C12, C15** and **C18** each have one common connection, while the two connections to **C21** are separate.



Rear view of the speaker unit, showing the coding of the connection panel fixed to T1. R20 is a small wire resistance across the speaker hum coil, L14, which is in two sections. L13 is the speaker speech coil, and L15 the field coil.

Condensers C3, C11.—These are in a single unit mounted on the chassis deck, with the leads passing through a hole in the chassis. The yellow-black and red-black leads belong to **C3,** and the yellow and black leads to **C11.**

Valve V2.—The connections for this A.C./D.C. double diode H.F. pentode are given in a diagram, showing the base as seen from the underside.

Condenser C26.—This is a small pre-set coupling and image suppressor condenser at the front of the chassis.

Fuses.—There are two of these, mounted on the mains switch and filter unit, together with one spare. The fuses are rated at 0.75 A, and are of the standard 1¼ ins. type.

CIRCUIT ALIGNMENT

For alignment a calibrated modulated oscillator and an output meter are required. The latter may be an A.C. voltmeter (0-1.5 V) connected across the speaker speech coil (Pink and blk/yel. on T1 terminal panel).

I.F. Circuits.—Couple oscillator to control grid (thimble) of **V1,** first removing lead already connected. Set receiver to M.W. (about 220 m.), volume control at maximum and oscillator to **456 KC/S.** Adjust I.F. trimmers for maximum output in the order: **C32, C33, C34, C35.** Check over the adjustments in the same order, progressively reducing input to prevent overloading.

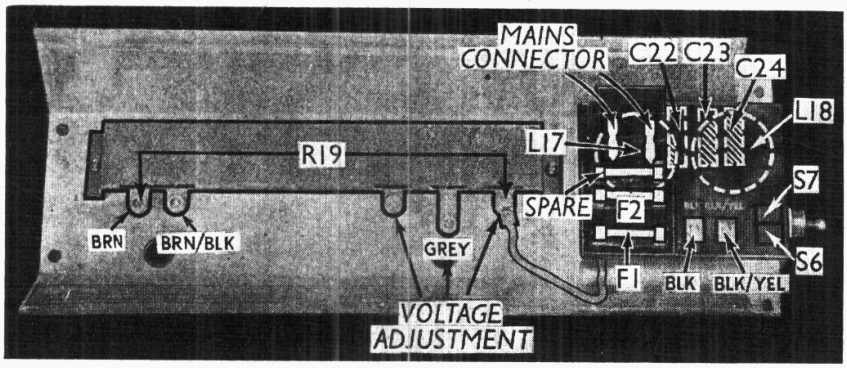
Signal Frequency Circuits.—Connect aerial and earth to receiver (A1 socket), and couple oscillator to aerial lead. Set receiver and oscillator to 200 m. (sensitivity switch in). Receiver volume control should be at maximum, and oscillator input reduced to prevent overloading.

Adjust **C28** for maximum deflection. Set oscillator and receiver to 230 m. and adjust **C30** similarly. Check these trimmers on 500 m. If either trimmer is appreciably incorrect, tracking is inaccurate, and chassis should be returned for factory matching. Check again at 200 m.

Set oscillator to 456 KC/S, and increase input until a reading is obtained on output meter. Adjust **C25** for *minimum* deflection.

Set oscillator and receiver to 1,400 m. Adjust **C31** for maximum output, at the same time rocking gang condenser slightly to improve results.

Set oscillator to 261 m. and tune receiver to the image on 1,260 m.(approx.). Adjust **C26** for *minimum* deflection.



View of the mains switch, filter and heater ballast resistance unit. C22, C23, C24, L17 and L18 are inside the black moulded case, with S6, S7, the double pole mains switch.